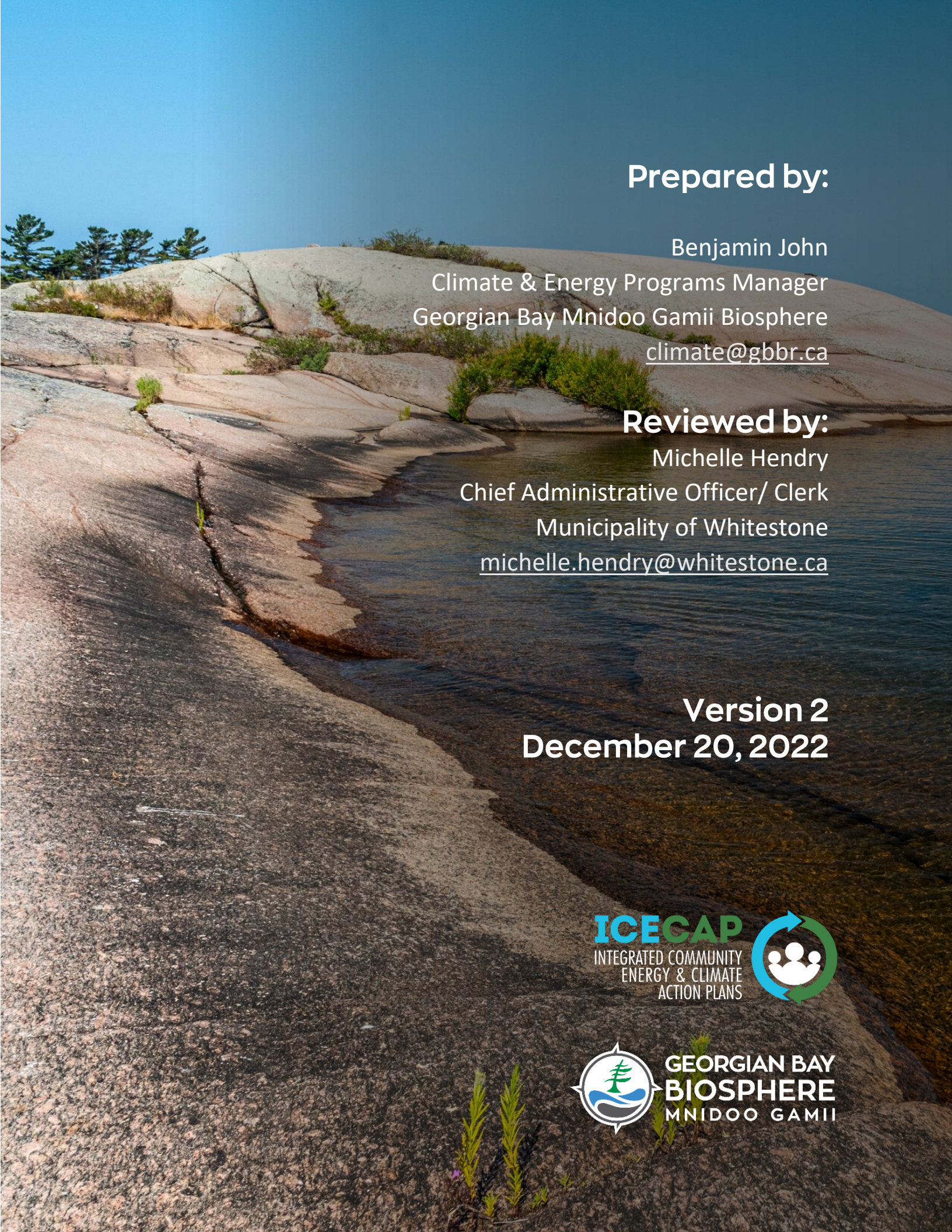
Municipality of Whitestone Corporate Milestone 1

Baseline Emissions Inventory & Forecast



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ICECAP
INTEGRATED COMMUNITY ENERGY & CLIMATE ACTION PLANS

GEORGIAN BAY BIOSPHERE
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Foreward

In addition to participating in the Federation of Canadian Municipalities' (FCM) Partners for Climate Protection (PCP) Program, the Municipality of Whitestone is a proud member of the Integrated Community Energy and Climate Action Plans (ICECAP) Partnership.

ICECAP is a partnership between the Municipalities and First Nations located in the Georgian Bay Biosphere region for the purpose of a collaborative, more cost-effective approach to energy management and the reduction of greenhouse gas emissions for the operations of each corporate stakeholder, for each participating community and for the broader region.

The 4 main objectives of ICECAP are to:

1. Encourage the reduction of greenhouse gas emissions
2. Improve energy efficiency
3. Reduce the use of fossil fuels
4. Adapt to a changing climate by building greater resilience

By completing this corporate baseline and inventory, the Municipality of Whitestone is also contributing to the achievement of the goals and objectives established by ICECAP. The findings and insights discovered will improve local climate change knowledge by understanding where emissions are coming from in the Municipality of Whitestone's internal operations. As a result, the information obtained will ultimately inform and provide direction into climate change and energy planning for the Municipality of Whitestone, the ICECAP partnership, and the broader region.

ICECAP's current members are as follows:

- Township of the Archipelago
- Township of Carling
- Township of Georgian Bay
- Municipality of Whitestone
- Municipality of McDougall
- Township of McKellar
- Town of Parry Sound
- Township of Seguin
- Shawanaga First Nation
- Moose Deer Point First Nation
- Georgian Bay Biosphere

EXECUTIVE SUMMARY

In their Fifth Assessment Report (2014), the Intergovernmental Panel on Climate Change notes that greenhouse gas (GHG) emission growth continues to accelerate, and that ambitious and aggressive mitigation actions are indispensable in mitigating climate change. By actively managing, monitoring, and taking measures to limit the production of GHG emissions, the impacts of climate change will reduce in severity.

As front-line responders to severe weather events and other climate change impacts, municipalities often experience and witness the financial, environmental, and social repercussions of climate change within their own operations and the community they serve. Municipalities therefore have the ability to be leaders in addressing climate change, as their knowledge of community needs and considerations can guide the successful implementation of initiatives designed to tackle climate change. As the Federation of Canadian Municipalities (2009) has noted, municipal governments can influence or control nearly half of Canada's GHG emissions. Through efforts to reduce GHG emissions, municipalities can therefore lead the way in climate change mitigation and protect their residents from future climate change impacts.

By taking the appropriate steps to respond to climate change through mitigation and adaptation, municipal governments also can save money in municipal operations, lower energy costs for residents and businesses, and increase investment in the local economy. Establishing a GHG emission baseline is a useful tool to identify areas for improvement, inform the development of a GHG reduction action plan, estimate cost savings from reductions, and serve as a reference point to track improvements. To do this, many municipalities in Canada have joined the Federation of Canadian Municipalities' Partners for Climate Protection (PCP) program to reduce the GHG emissions produced by their operations and community.

The PCP program looks at energy consumption and greenhouse gas emissions from two perspectives; corporate and community. Corporate refers to the GHG emissions produced as a result of a local government's operations and services. Its purpose is to identify the GHG emissions within a local government's direct control or influence, and for which the local government is accountable as a corporate entity. Community refers to the GHG emissions generated by the residents and businesses of the community in which the local government serves and represents.

This report will focus on the Municipality of Whitestone's corporate operations. Its purpose is to establish a corporate GHG emission baseline and inventory as part of the Municipality of Whitestone's participation in the PCP program and ICECAP.

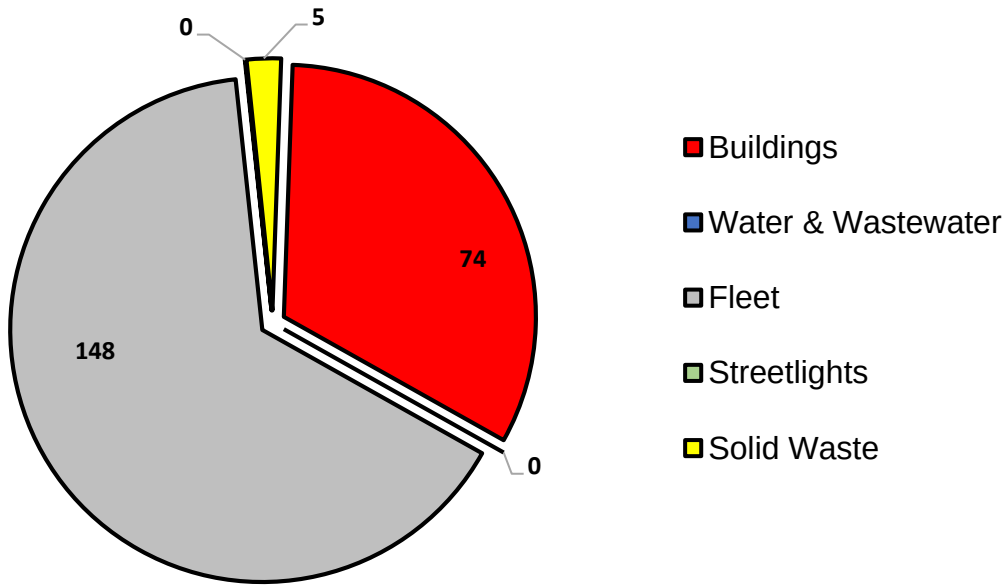
The Municipality of Whitestone's corporate greenhouse gas (GHG) inventory is intended to identify and quantify the sources of GHG emissions from its municipal operations and establishes a baseline from which future emissions reductions and progress can be measured. With the production of this inventory, the baseline year of 2016 has been established. Table A lists the Municipality of Whitestone's corporate emission sectors.

Table A: Municipality of Whitestone's Corporate GHG Emission Sectors

GHG Emission Sectors	Metric Tonnes of CO_2e
Buildings	74
Water & Wastewater	0
Streetlights	0.1
Fleet	148
Waste	4
Total Emissions	**226**

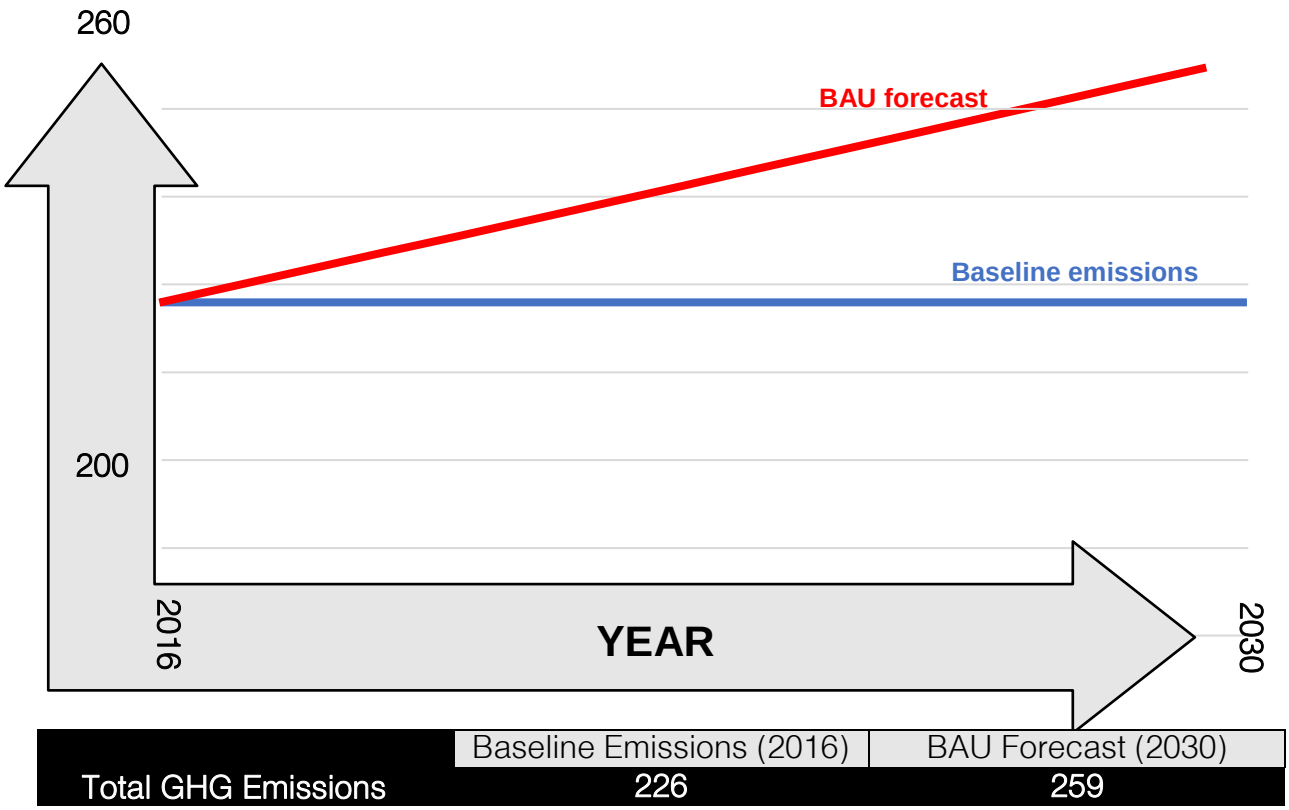
The Municipality of Whitestone's fleet is its largest emitting sector, accounting for 65.2% of its corporate GHG emissions in 2016. This is followed by the buildings sector, which produced approximately 33% of corporate GHG emissions. Figure A shows the GHG emissions associated with each sector.

Figure A: GHG Emission Sectors



As part of Corporate Milestone 1, municipalities are also required to forecast GHG emissions to a specified year, based on permanent-resident population growth. However, this is problematic and unrepresentative in producing a business as usual (BAU) forecast since the Municipality of Whitestone was experiencing a decline in its permanent resident population in 2016. This population decline would therefore demonstrate that GHG emissions would decrease naturally as the permanent-resident population shrinks, a situation which can be assumed to be untrue, given the influence seasonal residents have over the production of corporate GHG emissions in the Municipality of Whitestone. As a result, an alternative metric using annual residential property growth rate was developed to capture the influence seasonal residents have on corporate GHG emissions. With an average annual residential property growth rate of 0.95%, corporate GHG emissions are expected to increase 14.2% by 2030 if no actions are taken to reduce GHG emissions. This will result in corporate GHG emissions totaling 259 tCO_2e in the year 2030. Figure B shows the anticipated GHG emissions growth in this BAU scenario.

Figure B: Business as Usual Forecast



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INTRODUCTION

Establishing a GHG emission baseline is a useful tool to identify areas for improvement, inform the development of a GHG reduction action plan, estimate cost savings from reductions, and serve as a reference point to track improvements or explainable changes. To do this, many municipalities in Canada have joined the Federation of Canadian Municipalities' Partners for Climate Protection (PCP) program to reduce the GHG emissions produced by their operations and community.

What is the Federation of Canadian Municipalities?

The Federation of Canadian Municipalities (FCM) is the national voice for municipal governments in Canada. With a congregation of nearly 2,000 municipal members across the country, FCM advocates for municipalities to ensure their citizen's needs are reflected in federal policies and programs. Through this advocacy the FCM is able to provide funding and programming that help municipalities tackle local challenges, such as climate change, asset management, economic development, and more.

What is the Partners for Climate Protection Program?

The Partners for Climate Protection (PCP) program is designed to guide municipalities through the process of reducing greenhouse gas emissions through climate change and energy planning. In partnership with the International Council for Local Environmental Initiatives (ICLEI), the PCP program is administered by the FCM. Since the program's establishment in 1997, nearly 400 municipalities across Canada have joined, with the Municipality of Whitestone becoming a participant in 2022. The PCP program consists of a five-step milestone framework that guides municipalities in their efforts to reduce greenhouse gas emissions. The five milestones are as follows:

The Partners for Climate Protection program looks at these milestones from two different perspectives; corporate and community. Corporate refers to the greenhouse gas emissions produced as a result of a local government's operations and services. Its purpose is to identify the GHG emissions within a local government's direct control or influence, and for which the local government is accountable as a corporate entity. Community refers to the greenhouse gas emissions generated by the residents and businesses of the community in which the local government serves and represents.

This report will focus on the Municipality of Whitestone's corporate operations. Thus, the purpose of this report will be to establish a corporate greenhouse gas emission baseline and inventory as part of the Municipality of Whitestone's participation in the Partners for Climate Protection program and ICECAP.

METHODOLOGY BACKGROUND

Greenhouse Gas Emissions Inventory

A greenhouse gas (GHG) inventory brings together data on community and municipal sources of GHG emissions to estimate emissions for a given year. Ideally, two separate GHG inventories and forecasts will be created for the Municipality of Whitestone (MW): one for municipal operations and one for community sources. As per the PCP protocol, the inventories consist of the following sources of GHG emissions.

Corporate

- Buildings
- Streetlights
- Water and Sewage Treatment
- Municipal Fleet
- Solid Waste

Community

- Residential
- Commercial and Institutional
- Industrial
- Transportation
- Solid Waste

Scope

This document will focus solely on corporate GHG emissions.

Baseline Year

Establishing a baseline is a useful tool to identify areas for improvement, inform the development of a GHG reduction action plan, estimate cost savings from reductions, and serve as a reference point to track improvements. A baseline year of 2016 was selected because during the development of this baseline, it was the year in which the most recent Statistics Canada Census was published, providing the most recent data on population statistics. Other ICECAP members have also selected 2016 as their baseline year, which allows the MW to easily benchmark its emissions and energy-intensity performance against neighbouring municipalities. This will assist in identifying opportunities for energy efficiency and conservation initiatives that will lead to emissions reductions and cost savings.

Data Collection and Sources

To determine the GHG emissions produced by the MW's corporate operations, data was collected from municipal records where possible. Data quality was assessed primarily on its relevance. While data accuracy is also a critical characteristic when assessing data quality, data accuracy received a secondary role. This is because most of the data was retrieved from reputable and trustworthy sources and can thus be considered accurate. See Table 1 for corporate data sources and quality.

Table 1: Corporate Energy & GHG Emissions Baseline Data Sources

Sector	Data	Source	Data Quality	Notes
Buildings	Electricity Consumption	Municipal Records	High	Actual energy consumption for baseline year.
	Fuel Oil Consumption	Municipal Records	High	Actual energy consumption for baseline year.
	Propane Consumption	Municipal Records	High	Actual energy consumption for baseline year.
Streetlights	Electricity Consumption	Municipal Records	High	Actual energy consumption for baseline year.
Fleet	Diesel Consumption	Municipal Records	Medium	Actual diesel consumption for baseline year.
	Gasoline Consumption	Municipal Records	Medium	Actual gasoline consumption for baseline year.
Waste	Tonnes of Waste	Assumptions	Low	Based primarily on assumptions.
	Degradable Organic Carbon	PCP Protocol	Medium	Quantities and types of waste disposed at landfill in baseline year.
	Landfill Characteristics	Municipal Records	Medium	Actual landfill characteristics and management practices provided by staff.
BAU Forecast	Residential Property Growth Rate	MPAC	High	Actual quantity of residential properties for baseline year and prior years.

CALCULATION PROCESS

Buildings & Facilities

To calculate the GHG emissions produced by the MW's buildings and facilities the PCP recommended approach of obtaining actual energy consumption data for the baseline year was pursued. For reference, a simplified version of the formula used for calculating building and facility emissions as per the PCP protocol is as follows.

Formula

$$\sum(FC * Cef) + (FC * CHef * CHwp) + (FC * Nef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

Cef = Emission factor for Carbon Dioxide (CO_2)

CHef = Emission factor for Methane (CH_4)

Nef = Emission factor for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

Assumptions

No assumptions were made in calculating GHG emissions produced by corporate buildings and facilities because actual energy consumption data was available.

Outcome

The MW's buildings and facilities produced **74** tCO_2e in 2016. For a summary of the quantities of each fuel source consumed by the residential buildings in the MW, please see Table 2.

Table 2: Buildings & Facilities Energy Consumption (2016)

Year	Electricity (kWh)	Natural Gas (m^3)	Fuel Oil (L)	Propane (L)
2016	119,208	0	16,869	15,024

Water & Wastewater

The Municipality of Whitestone does not provide water or wastewater services to its residents. As a result, no GHG emissions are generated through this category and no calculation is warranted. For reference however, a simplified version of the formula for calculating water and wastewater as per the PCP protocol is as follows.

Formula

$$\sum(FC * Cef) + (FC * CHef * CHwp) + (FC * Nef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

Cef = Emission factor for Carbon Dioxide (CO_2)

CHef = Emission factor for Methane (CH_4)

Nef = Emission factor for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

Assumptions

No assumptions were made in calculating the GHG emissions produced by water and wastewater treatment/delivery because actual energy consumption data does not exist.

Outcome

The MW's water and wastewater infrastructure produced 0 tCO_2e in 2016.

Streetlights and Outdoor Lighting

To calculate the GHG emissions produced by the MW's streetlights and outdoor lighting the PCP recommended approach of obtaining actual energy consumption data for the baseline year was pursued. For reference, a simplified version of the formula used for calculating streetlight emissions as per the PCP protocol is as follows.

Formula

$$\sum(FC * Cef) + (FC * CHef * CHwp) + (FC * Nef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

Cef = Emission factor for Carbon Dioxide (CO_2)

CHef = Emission factor for Methane (CH_4)

Nef = Emission factor for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

Assumptions

No assumptions were made in calculating the GHG emissions produced by streetlights and outdoor lighting because actual energy consumption data was available.

Outcome

The MW's streetlighting produced 0.1 tCO_2e in 2016.

Fleet

To calculate the GHG emissions produced by the MW's fleet the PCP recommended approach of obtaining actual fuel consumption data for each municipal vehicle in the baseline year was pursued. For reference, a simplified formula is as follow:

Formula

$$\sum(FC * VTC) + (FC * VTCHef * CHwp) + (FC * VTNef * Nwp)$$

Where:

FC = Amount of fuel by type consumed

VTC = Emission factor by vehicle type for Carbon Dioxide (CO_2)

VTCHef = Emission factor by vehicle type for Methane (CH_4)

VTNef = Emission factor by vehicle type for Nitrous Oxide (N_2O)

CHwp = Global warming potential of Methane

Nwp = Global warming potential of Nitrous Oxide

Assumptions

While actual fuel consumption was known for the baseline year, the amount of fuel consumed by each vehicle was not. As a result, it was assumed that all vehicles consuming diesel used the same amount of fuel. This assumption was also applied to vehicles consuming gasoline. This assumption is justified because the vehicles in the MW's fleet have similar emission factors. Therefore, the GHG outcome will be similar regardless of how fuel is disaggregated. For example, a snowplow may have used more fuel than a backhoe, but since they have similar emission factors, a set amount of fuel consumed between the two vehicles will result in roughly the same amount of GHG emissions regardless of which vehicle consumed more of the set fuel amount in reality.

Outcome

The MW's fleet produced 148 tCO_2e in 2016. For a summary of the fuel consumed by the MW's fleet, please see Table 3.

Table 3: Fuel Consumed by the MW's Fleet

Year	Diesel (L)	Gasoline (L)
2016	48,082	7,409

Corporate Solid Waste

Since actual data on corporately generated waste is not available, local governments can estimate the quantity of solid waste generated at corporate buildings and facilities and the quantity of community waste that is diverted as part of municipal operations. This estimate is based on the size of the garbage bins used, their average fullness at pickup, and the frequency of pickup.

The type of landfill is another determinant of the formula used for estimating emissions from corporate solid waste. For reference, a simplified version of this formula, as per the PCP protocol is as follows.

Formula

$$\sum 25 * (GBC * BF * PU * 2.136) * \left(\left(\frac{16}{12}\right) * MCF * DOC * DOCF * F\right) * (1 - MR) * (1 - OX)$$

Where:

GBC = garbage bin capacity (m^3)

BF = Approximately how full the bin is when it is emptied (%)

PU = Frequency of pickup (times per month)

MCF = Methane correction factor

DOC = Degradable organic content

DOCF = Fraction of DOC dissimilated

F = Fraction of methane in landfill gas

MR = Methane recovery at landfill (%)

OX = Oxidation Factor

Assumptions

Although the MW owns and operates its own landfill, FCM has advised and approved the use of the corporate waste generation model for measuring corporate waste emissions. Gaining an understanding of solid waste practices and policies can help to determine some of the formula variables that are determinant on landfill management and operations.

It was assumed that when corporate solid waste is generated, it is either sent directly to the Auld's Road or York Street landfill. Staff at the MW have noted that no emission capture technology exists at either landfill. The landfill is actively managed as waste is covered to deter wildlife, to limit waste from blowing around, and to obtain a measure of compaction.

Data on the actual tonnage of corporate solid waste generated by the MW in 2016 does not exist. Therefore, it was assumed that each building owned and operated by the MW had a single, centralized bin for waste, sized at 0.08m^3, and was removed weekly to eliminate any odours. This is equivalent to 2 large-sized garbage bags being produced per week. It should be noted that this represents an average across all buildings, with varying levels of daily occupancy. For example, the Roads Depot may produce twice this amount in a given week, whereas the Administrative Office may produce half this amount.

Outcome

The MW's corporate operations produced **4** tCO_2e in 2016.

Business as Usual Forecast

At this time, the year 2030 has been chosen for the BAU forecast.

Assumptions

In Statistics Canada 2016 Population Census it was reported that the MW experienced a decline in population between the years 2011 and 2016. Given that the BAU forecast is determined by annual population growth, it was determined that the reported decline in population would be unrepresentative of corporate operations and the projected BAU for the following reasons.

Geographically positioned near the eastern shoreline of Georgian Bay and in the heart of cottage country, the MW and the surrounding region is a tourist destination. In addition to the numerous cottages and seasonal residences that attract tourists within the MW, there is a high volume of traffic and activity that passes through the MW to reach seasonal destinations. As a result of this tourism, an increase in population occurs during the warmer months, raising the population from 916 permanent residents to include thousands of extra seasonal residents. However, Statistics Canada only accounts for the 916 permanent residents in their 2016 Population Census. As a result, Statistics Canada's population decline is derived from permanent residents, failing to account for the seasonal population influx. This is problematic and unrepresentative in producing a BAU forecast because the services and amenities provided by corporate operations are not restricted for permanent resident use only. For example, the MW provides the numerous seasonal residences with emergency services, and seasonal residents utilize roads and other local infrastructure, causing additional wear-and-tear that requires municipal staff to maintain and repair. Therefore, as seasonal population grows, so too will corporate operations, and the associated GHG emissions.

Essentially, using Statistics Canada's population decline would demonstrate that there would be a natural decrease in GHG emissions as population shrinks, a situation which can logically be assumed to be untrue, given that municipal operations are conducted on behalf of all residents residing in the jurisdiction, not just the permanent ones. As a result, the following methodology and assumptions were considered in producing a growth statistic that would factor seasonal population in producing a BAU forecast.

Data was first retrieved from the Municipal Property Assessment Corporation (MPAC). This data was referenced because it classifies each property in Ontario according to its functional purposes. For example, data entries categorized as a 300 series property are classified as a residential property, including both permanent residences and seasonal residences.

It can be difficult to assume the number of people that are staying at a seasonal residence at any given time. For example, it is common for numerous different families to utilize a single seasonal residence throughout the summer. This produces a high degree of variability in the population of any single seasonal residence, as one week could have 3 residents occupying the premises and the following week could have 8. From a calculation perspective, the most appropriate response would be to use a provincial statistic, such as the average number of residents per household. However, using a statistical average such as the average number of residents per household results in a static number, and shifts the aspect of variability to the object it represents, which in this case is the household. Therefore, accounting for seasonal population in an annual population growth rate would require calculating the growth rate of the number of residential properties as determined by MPAC. Based on the static nature of the number of residents per household, it was assumed that the growth rate of the number of residential properties would be the same as population, and that municipal operations would grow at a similar rate to match the added demand of municipal services. As a result, the annual growth rate of residential properties was used to determine the BAU forecast.

Given that the BAU forecast was determined by annual residential property growth, multiple years of data was used to eliminate the possibility of an outlier skewing the calculation result. With this consideration, the residential property growth rate from 2011 to 2016 was calculated, and then averaged on a year-by-year basis. This resulted in an average annual residential property growth rate of 0.95%. This growth rate was then used to forecast emissions to the year 2030.

Outcome

Given an average annual residential property growth rate of 0.95% forecasted to the year 2030, the MW's operations are expected to produce 259 tCO_2e in 2030, representing a 14.2% increase from baseline levels if business is to continue as usual.

Thank You
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This report has been developed in partnership with the Georgian Bay Mnidoo Gamii Biosphere (GBB), with input from ICECAP members and partners.

The GBB is an inclusive and dynamic organization that builds capacity for regional sustainability in eastern Georgian Bay.

The GBB is a non-profit registered Canadian charity governed by a Board of Directors.

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